SAE I-MAC CRP
Team Four: Service

Goal:

Reduce

By 50%

Reducing Refrigerant Emissions at Service and Vehicle End of Life

Mobile Air Conditioning Summit 2005

March 15 - 16

Sacramento, CA

Sources of Emissions

Service Issues & Other Issues

- Systems topped off (customer request)
- D-I-Y top offs
- Leaks not found (equipment, technique)
- No recovery/recycling
- Inadequate recovery/recycling
- Improper diagnosis and repair
- Faulty replacement component
- Losses from disposable containers (30 lb. cylinders and small cans)

9. Losses at vehicle end of life

Survey of Service Industry: Leak Detection a Major Problem

Finding Leaks a Major Problem For Service:

- **Tools**
- **Procedure**
- **Vehicle Design, Part Placement**

Service Team Approaches: Leak Detection

Difficulty Tracing Buried Lines

Finding Shaft Seal Leaks

Verifying Evap Leaks

Working Group 1: Leak Detection Equipment/Procedure

- Evaluate current generation tools and techniques
- Develop new generation of tools and improved techniques
- Write new tool standards and detection procedures
- Challenge: Identification of even smaller leaks

Service Team Approaches: Recovery/Recharging Equipment

Precise Charge Required For New Systems To Operate Properly

Working Group 2: Recovery and Recharging Equipment and Procedures

- **Some refrigerant remaining after standard recovery procedure**
- **More complete recovery**
- **More precise charging**
- **Write new equipment standards and charging procedures**

Service Team Approaches: Recovery/Recharging Equipment

Duct Tape Will Not Be Part Of The Solution

Service Team Approaches: Recovery/Recharging Equipment

Proper Care Of Tools Is Also An Issue

Service Team Approaches: Recovery/Recharging Equipment

Maintenance Of Tools And Equipment Very Important

Incorrect charge – Some reasons why

Scales must be regularly checked and calibrated

Service Team Approaches: Field Coupling

Liner notes

Working Group 3: Leak Certification Process for Field Coupled Aftermarket Replacement Flexible Hose Assemblies

- **Test and evaluate hose couplings, field assemblies**
- **Develop field test for verifying integrity of field assembled hoses**

Service Team Approaches: Repair Model

Experts Will Focus On All Aspects Of Repair

More Time On Recovery Less On Evac?

Working Group 4: Construct a valid repair model to better understand the sources of emissions in the repair process

The model will be used to make recommendations for best practices in the repair process, recovery practices, tools and system design changes for ease of serviceability that will reduce emissions and enhance recovery.

Service Team Approaches: Mass Balance

Number Cars Repaired?

Amount Recovered?

Unknown Losses?

Working Group 5: Develop an R134a mass balance for the US mobile A/C service market

47 Million pounds of refrigerant going into the mobile A/C aftermarket

How is the refrigerant being used?

A/C System Charge Significantly Reduced

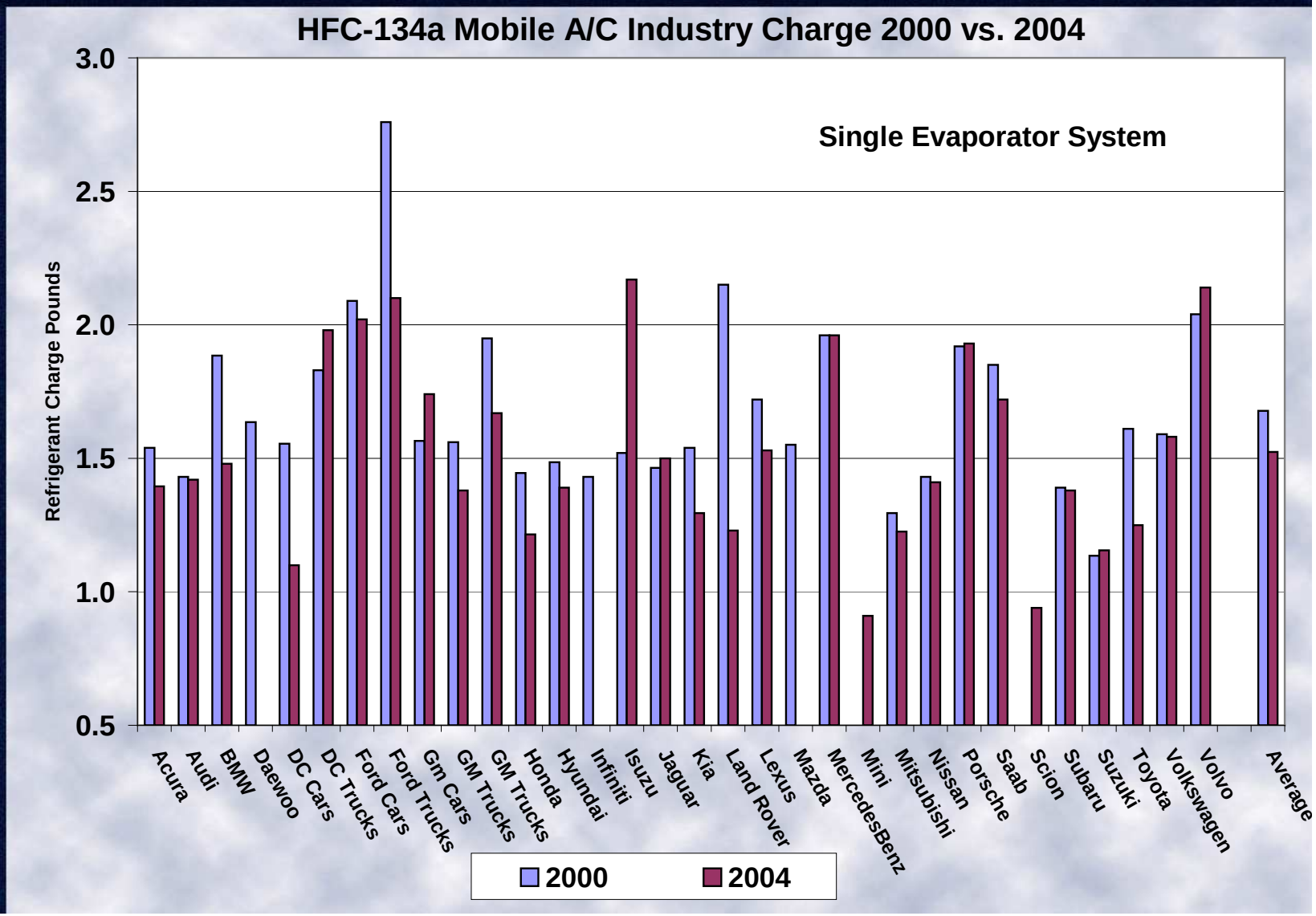
Liner notes

R134a charge average, ounces

1994: 31

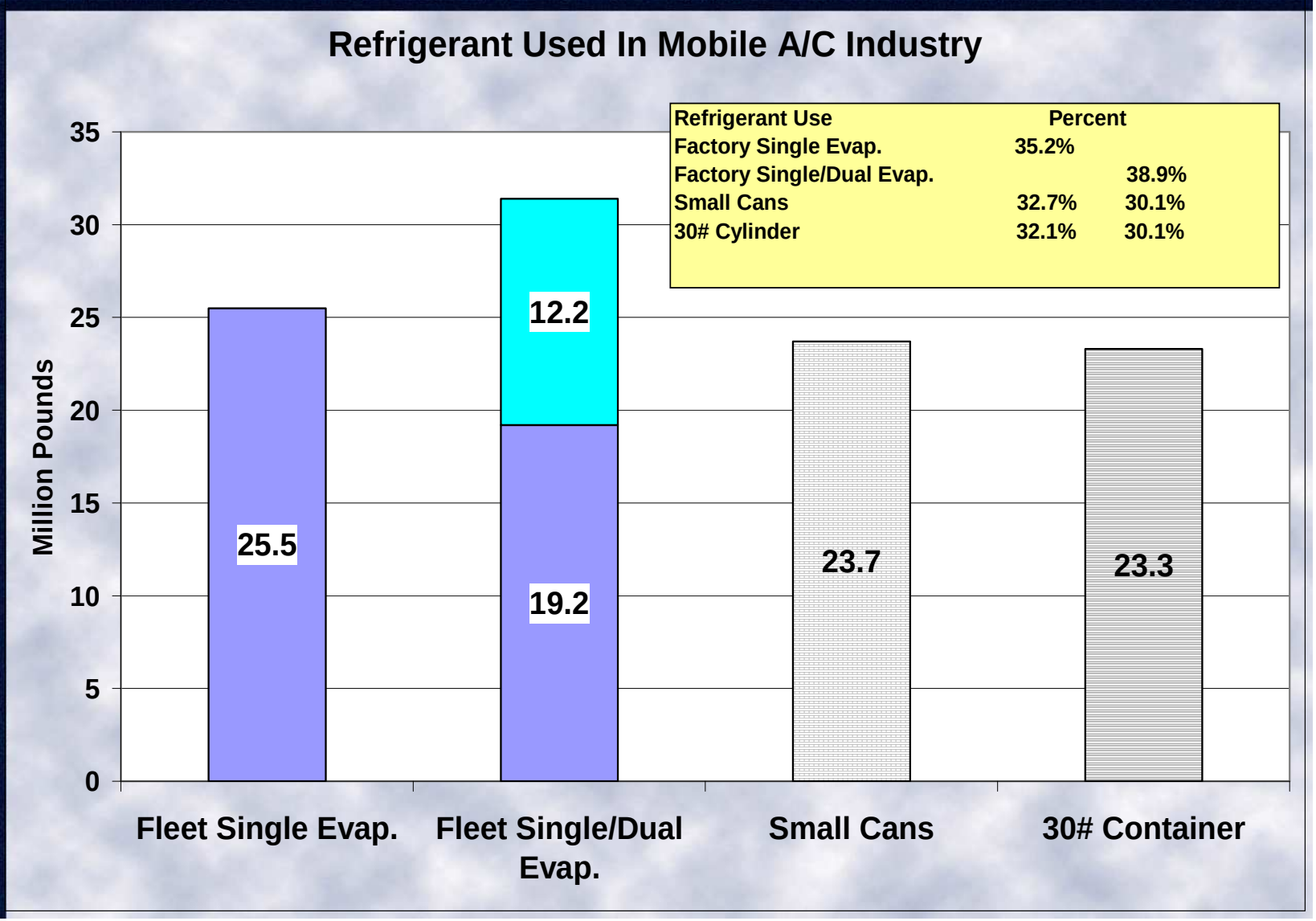
2000: 27

2004: 24



Mobile A/C Industry Refrigerant Use

Liner notes



Disposable Containers
30 Pound Cylinders

Liner notes

Assumptions for calculating emissions due to heels:	Estimated R134a emissions per year:
Case 1: **Pressure in cylinder is reduced to a "hard vacuum":** assume pressure is 5 psia and temperature is 80F. The amount of R134a remaining in the cylinder is 0.043 pounds	766,667 cylinders x 0.043 lbs/cyl = 32,967 pounds/yr (" best case")
Case 2: **Pressure in cylinder is reduced to a "vacuum" per MACS guidelines:** assume pressure is 14 psia and temperature is 80F. The amount of R-134a remaining in the cylinder is 0.12 pounds	766,667 cylinders x 0.12 lbs./cyl = 92,000 pounds/yr
Case 3: **Pressure in cylinder is reduced to 15 psig:** assume temperature is 80F. The amount of R-134a remaining in the cylinder is 0.26 pounds	766,667 cylinders x 0.26 lbs./cyl. = 199,333 pounds/yr

Service Team Approaches: Vehicle End-of-Life

Liner notes

Working Group 6: Vehicle End of Life

- Seeking partnerships with auto recycling groups
- Are refrigerant reclaimers getting refrigerant from salvage yards?
- Are service shops working with salvage yards to recover/recycle refrigerant?

Vehicle End-of Life

Liner notes

End-of-Life Vehicle Management

Each year in the U.S., 10 to 11 million vehicles reach the end of their useful lives.

12,000 Salvage Yards

182 Shredders

MAC Summit 2005

Liner notes

Thank You!

Elvis L. Hoffpauir, President

MACS Worldwide

P.O. Box 88

Lansdale, PA 19446

Phone: (215) 631-7020

Fax: (215) 631-7017

Website: http:///www.macsw.org